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**Title: NOTCHED BRUSH AND MAKE-UP DEVICE  
INCLUDING THIS BRUSH**

# NOTCHED BRUSH AND MAKE-UP DEVICE INCLUDING THIS BRUSH

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The invention relates to a brush, in particular to a brush for applying a cosmetic product to keratin fibers, especially for applying mascara to the eyelashes or a dye to the hair, as well as to a make-up device including this brush.

### 2. Description of the Related Art

Brushes are known, in particular from FR-A-2,605,505 and FR-A-2,715,038, for applying a cosmetic product which consists of a core into which bristles are fitted radially, these brushes having at least one concave notch which holds some of the product during wiping. Such brushes make it possible to vary the make-up, with more or less product being applied and a greater or lesser lengthening effect, depending on the shape of the notches and the way in which they are used. However, the notches have a continuous surface.

Also known, in particular from GB-A-2,170,996, are brushes for applying mascara to the eyelashes, these brushes having an alternating sequence of long bristles and short bristles forming a U-shaped notch. This type of brush only makes it possible to apply small quantities of mascara to the eyelash. Furthermore, the combing of the eyelashes and the spreading of the mascara on the eyelashes remains unsatisfactory.

## SUMMARY OF THE INVENTION

Although these conventional brushes give results which are overall satisfactory, it is desirable to provide brushes which allow the eyelashes to penetrate the brush sufficiently to allow the product to be smoothed properly and the eyelashes to be separated properly. It is therefore an object of the invention to provide a brush for which application remains simple and economical, and which is practical to use.

This object is achieved, surprisingly, with the aid of a first aspect of the invention, namely a brush comprising an elongate core, bristles fitted radially into this core, and at least one notch consisting of at least two secant faces, of which a first face is referred to as the "notch back" and a second face is referred to as the "notch front", defining by their intersection a trough line, wherein the two faces are asymmetric and form a reentrant angle  $\beta$ , at any point of their intersection, of between  $60^\circ$  and  $180^\circ$ .

This brush can be used to comb and/or make up the hair, the eyelashes, the eyebrows, etc. The external surface of the brush is defined by the ends of the bristles of this brush. The envelope surface of the brush is defined as the surface containing the ends of the longest bristles of the brush. The central axis of the brush is the axis defined by the core of the brush. The intersection of the brush with any plane perpendicular to the core of the brush is defined by a plane section of the brush.

The reentrant angle  $\beta$  of intersection of the notch back and of the notch front of a given notch is defined, for each plane section of the brush, as the angle between the tangents of the two faces of the notch at the trough line. Advantageously, for any plane of cross-section of the brush, the reentrant angle  $\beta$  is between  $90^\circ$  and  $160^\circ$ , more preferably between  $90^\circ$  and  $120^\circ$ .

The intersection of the notch front of one notch with the envelope surface of the brush or with the notch back of a second notch defines a peak ridge and constitutes, at any

point of intersection, the vertex of an emergent angle ( $\alpha$ ) whose two sides define a notch.

Preferably, the core is formed by the spiral winding of two branches of a wire, and the bristles are clamped between the wound branches of the core. Preferably, the notch back is plane or convex. Preferably, the notch front is plane or concave. According to the invention, the brush has one or more notches. Preferably, the notch or notches are obtained by trimming the brush.

10 The height  $h$  of the notch front for each plane of cross-section of the brush is defined as the distance between the intersection of this notch front with the envelope surface of the brush and the trough line. The value of  $h$  may vary along the axis of the core. The height  $H$  of the notch back for each plane section of the brush is defined as the distance between the intersection of this notch back with the envelope surface of the brush and the trough line. The value of  $H$  may vary along the axis of the core. Advantageously, in a given notch the notch front has a height less than the height of the notch back. Preferably, the notch front has a height of less than  $\frac{1}{3}$  of the height of the notch back, and more preferably less than  $\frac{1}{2}$  of the height of the notch back.

20 Each of the characteristics of this configuration (concavity of the faces, reentrant angle  $\beta$  and height of the faces) contributes to the formation of notches which are open, that is to say give open and progressive access to the trough line, the trough line being the region holding the greatest amount of mascara, then to the notch front which can support the eyelash over the entire height of this front in order to provide better spreading and combing. The notch may lie over all or part of the length of the brush, and the two faces preferably extend from one end of the brush to the other.

25 According to a variant of the invention, the trough line need not extend over the entire length of the brush, for example in at least one end of the brush the trough line stops before the end of the brush, either because the faces do not extend as far as this end, or because they merge into a continuous surface.

30 According to another variant of the invention, the notch or notches are of spiral shape, that is, the corresponding trough line and peak ridge may each have the shape of a spiral.

35 The longest bristles define the envelope surface of the brush. The brush may have any envelope surface: cylindrical, frustoconical, in the shape of a rugby ball, pyramidal, in the shape of a peanut, etc. It may consist of a plurality of sections with different envelope surfaces, for example a cylindrical brush ending in a frustoconical end. Thus, the brush may consist of at least two successive sections with different characteristics: sections with different envelope surfaces, sections which have notches and sections which do not. The peak ridges may optionally be trimmed so that they are rounded.

40 The shortest bristles of the trough line hold the greatest amount of mascara. Thus, when the user applies the brush to her eyelash, she can turn the brush between her fingers to vary the amount of mascara applied to the eyelash, with effective combing and spreading of the product. By imparting a translational movement to the brush along the eyelash, the user may also choose to increase the amount of mascara applied to the eyelash or to increase the combing, depending on the region of the brush which she applies to the eyelash.

45 A brush of this type makes it possible to obtain a make-up which is full-bodied, regular, elongated and curly. It is highly appropriate for making up the eyelashes, and so a second aspect of the invention provides a make-up device comprising a mascara reservoir and a mascara in the form of a brush as described above.

The brush preferably has a plurality of adjacent notches, with two neighboring notches defining between them, by their contours, at least one peak region of variable width (the width of a peak region being measured in a direction perpendicular to the central axis of the brush).

Furthermore, the bristles of the brushes according to the invention may be of any type: bristles with different heights, different diameters or different cross-sections and made of different materials, bristles with ends which are tapered, fork-shaped or pinhead-shaped, or which have been subjected to any type of treatment known to the person skilled in the art.

#### BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIGS. 1A and 1B are a perspective and views of a brush according to the invention, having a single grooved notch;

FIGS. 2 and 3 are perspective views of two alternative embodiments of brushes according to the invention;

FIGS. 4 and 5 are end views of two variants of brushes according to the invention, along the central axis of these brushes;

FIGS. 6, 7 and 8 are perspective views of variants of brushes according to the invention, with different envelope surfaces;

FIG. 9 is a sectional view of a device for eye make-up according to the second aspect of the invention;

FIG. 10 is a perspective view of a variant of a brush according to the invention, having a cylindrical section and a conical section; and

FIG. 11 shows a variant of a brush according to the invention, having a first section which is free of notches and a second section which has notches.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a brush 101 for applying a cosmetic product, in particular for applying mascara to the eyelashes, comprising an elongate core 102 (which has been shown in this Figure even though it is inside the brush) formed by the spiral winding of two branches of a wire 103 which was folded into a U-shape before the branches were twisted.

The core 102 is fixed by force-fitting a stem 1 at the end. Bristles 104 are fitted radially between the branches of the wire 103. When the branches of the wire 103 are twisted, the bristles are clamped and held between the spiral turns of the core 102. The axis of the core 102 may coincide with the axis I—I of the envelope surface 101.1 of the brush as in the Figures, but these two axes could be offset. The bristles 104 may be made of natural or synthetic and optionally flocculated fibers. The brush 101 may include a mixture of bristles of different types (different diameters, different cross-sections).

The envelope surface 101.1 of the brush is a cone frustum having a central axis I—I which coincides with the axis of the core 102, and has two ends constituting plane sections of the brush: the top section 105.1 of the front of the brush and its plane base 105.2 at the back of the brush. The brush has a notch 106 consisting of two secant faces: the notch front 106.1 and the notch back 106.2 extending from one end of the brush to the other.

The face 106.1 is straight and forms an emergent angle  $\alpha$ , constant over the entire length of the brush, with the envelope surface of the brush. The two faces 106.1 and 106.2 form between them a reentrant angle  $\beta=120^\circ$  which is constant from one end of the brush to the other.

The face 106.2 is convex. The entire surface of the brush (conical surface 101.1, notch front 106.1 and notch back 106.2) consists of generatrices converging to a fixed point P lying on the central axis I—I of the brush.

The intersection of the two faces 106.1 and 106.2 defines a straight trough line 107 which also converges to P. The intersection of the notch front 106.1 with the envelope surface of the brush 101.1 defines a straight peak ridge 108.1 converging at P.

The notch back 106.2 of the brush 101 shown in FIGS. 1A and 1B is rounded, its radius being adjusted so that the notch back 106.2 is tangent to the envelope surface 101.1 of the brush, but according to a variant 106.2 and 101.1 may be chosen to be secant and to define a second peak ridge.

The notch front 106.1 has a height h, and the notch back 20 has a height H, which vary along the core. The relationship  $h < \frac{1}{2} H$  is satisfied in each plane section of the brush.

The notch 106 is obtained by trimming the brush 101, that is by cutting the bristles 104 with a clipper. The notch 106 lies on a single side of the brush, and so is not cut through the core 102.

The brush 111 shown in FIG. 10 differs from the one shown in FIG. 1 in that it has two separate sections, one  $S_1$  with a cylindrical envelope surface 111.11, and the other  $S_2$  with a conical envelope surface 111.12 like that of the brush in FIG. 1, these two sections merging at their equal diameters. The notch front 116.1 and the notch back 116.2 extend over the two sections. Their respective heights h and H are constant over the entire cylindrical section  $S_1$  then decrease along the conical section  $S_2$ . The angle  $\beta$  between the notch front 116.1 and the notch back 116.2 is constant over the entire length of the brush. The trough line consists of two line segments: the line segment 117.1 in the cylindrical section, which is parallel to the axis of the core, and the line segment 117.2, in the conical section, which converges to a point lying on the axis of the core. A brush of this type allows beneficial make-up variations to be obtained.

The brush 201 shown in FIG. 2 differs from the one shown in FIGS. 1A and 1B in that it has four identical notches 206, each occupying an angular sector of  $90^\circ$  of the surface of the brush. The straight notch front 206.1 of one notch and the rounded notch back 206.2 of the preceding notch define together a notch 210 and a peak line 208.1. The surface of the brush 201 has 4 protruding notches separated by four trough lines 207, these notches being spaced from one another by a  $90^\circ$  rotation about the central axis II—II of the brush. An observer positioned at the stem side end of the brush sees a succession of notches oriented to the right; in a given notch 210, the straight notch front 206.1 is placed to the right of the rounded notch back 206.2. The pitch of the brush is thus right-handed.

According to a variant of the invention, provision may also be made for the pitch to be left-handed. Provision may also be made for the brush to have two successive sections: one with a left-handed pitch and the other with a right-handed pitch. The pitch is preferably the same over the entire length of the brush.

The brush 301 shown in FIG. 3 differs from the brush in FIG. 2 in that it has three notches 310, each occupying an angular sector of  $120^\circ$ .

The brushes shown in FIGS. 2 and 3 have regular adjacent notches, that is, the cone is divided into an integer number

of equal angular sectors (a number equal to the number of notches), each of these angular sectors being bounded by 2 peak ridges and 2 trough ridges of two successive notches, the notches being derived from one another by rotating the brush about its central axis. However, provision may be made for the notches to be irregular: unequal angular sectors, notches with different characteristics.

For example, FIG. 4 shows a brush 401 according to the invention which differs from the one shown in FIG. 2 in that two successive notches have neither the same depth nor the same angular width: in each plane section of the brush, the depth of the notch is measured as the distance from the trough line to the envelope surface. The angular width of a notch is the angle between the ridge lines delimiting this notch. The notches are irregular; a notch 406.a of depth  $da$  (variable along the axis of the core) and angular width  $\delta a$  alternates with a notch 406.b of depth  $db$  (variable along the axis of the core) and angular width  $\delta b$ , with:

$$da > db, \text{ and}$$

$$\delta a > \delta b.$$

Provision may also be made for the notches to be separated and not adjacent, which has the result that, on the surface of the brush, uncut spaces or peak regions of the envelope surface are left between two successive notches. This possibility is illustrated by FIG. 5, which shows a brush 501 according to the invention which has an alternating sequence of peak regions 509 and notches 506.

The brush 601 shown in FIG. 6 differs from the one shown in FIG. 2 in that it has a surface with parallel generatrices (convergence point P at infinity) and that the notch backs 606.2 are plane. The trough lines are parallel to the generatrices of the brush. This brush can be obtained from a cylindrically shaped brush into which the straight faces are cut. The angle  $\beta$  between the notch back 606.2 and the notch front 606.1 satisfies:  $90^\circ < \beta < 120^\circ$ . In this Figure, the heights  $h$  and  $H$  of the faces 606.1 and 606.2, respectively, are constant over the entire length of the brush. According to a variant of the invention,  $h$  and  $H$  may be varied along the central axis of the brush. The emergent angle  $\alpha$  and reentrant angle  $\beta$  are constant over the entire length of the brush.

The brush 701 shown in FIG. 7 differs from the one shown in FIG. 2 in that it has an envelope surface 701.1 having the shape of a peanut. It has three regular adjacent notches 706. The notch fronts 706.1 are plane and have a height  $h$  which is constant over the entire length of the central axis of the brush. The notch backs 706.2 are rounded. The height of the notch backs  $H$ , which is variable along the central axis of the brush, satisfies  $H > 2h$  in any cross-section of the brush. The angle  $\beta$  between the notch back 706.2 and the notch front 706.1 is constant along the axis of the core and satisfies:  $90^\circ < \beta < 160^\circ$ .

The brush 801 shown in FIG. 8 differs from the one shown in FIG. 2 in that it has an envelope surface having the shape of two cone frustums assembled via their bases of equal diameter. It has four regular adjacent notches 806, each 55 consisting of a plane notch front 806.1 and a rounded notch back 806.2. The trough line 807 is a straight line parallel to the central axis of the brush. The angle  $\beta$  between the notch back 806.2 and the notch front 806.1 is constant along the axis of the core and satisfies:  $90^\circ < \beta < 160^\circ$ .

The brush 1101 according to the invention and shown in FIG. 11 differs from the ones shown in FIGS. 1 to 8 in that it has two separate successive sections S1 and S2. Along the entire section S1, the brush has a cylindrical shape and is free of notches. Along the section S2, the envelope surface 65 of the brush is cylindrical, with an axis coinciding with the central axis of the brush and the same diameter as the

cylinder. Over the entire length S2 are regular adjacent cut-outs 1106 which have straight trough lines 1107, parallel to the central axis of the brush, and forming regular adjacent notches 1110. The cross-section s is at the intersection of S1 and S2. The trough lines 1107 are segments of lines which, like the cuts 1106 and the notches 1110, are interrupted at s.

The eye make-up device shown in FIG. 9 comprises a cylindrical reservoir 920 which has a threaded neck 924 topped by a seal 925, and which is filled with mascara 915. The reservoir 920 has a wiping constriction 921 in its neck, the wiping constriction being held in position in the neck by a bead 926 which interacts with the shoulder separating the neck from the reservoir 920 proper. In a known fashion, the wiping constriction 921 is made of a flexible and elastic material.

An applicator intended to interact with the reservoir 920 consists of a gripping means 923 which supports the application element 930 and comprises a stem 922 and a brush 901 corresponding to those shown in FIG. 1. The gripping means 923 has the shape of a cap with a screw thread 923a which interacts with the screw thread 924a of the neck of the reservoir. The reservoir 920 is closed in leak-tight fashion by screwing the gripping means 923 onto the neck 924 of the reservoir.

When the application element 930 is extracted from the reservoir, the brush loaded with mascara passes through the wiping constriction 921. This wipes the long bristles of the peak regions much more than the short bristles (around the trough line) of the notch. During application to the eyelash, the notch supports the eyelash via the notch front, in particular via its peak ridge, in the manner of a comb, and separates and combs the hairs of the eyelash, then the notch back supports the eyelash as far as the trough line while applying mascara to the base of the hairs of the eyelash, which a second notch has just spread.

In comparison with the known notched brushes, the brush according to the invention provides the advantage of allowing support by the notches for styling and curling the hairs of the eyelash, which is more effective than in brushes with rounded concave notches. Furthermore, the fact that the notches are open allows better access to the product held around the trough line.

Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that the invention may be practiced otherwise than as specifically described herein.

What is claimed is:

1. A brush comprising:  
an elongate core defining a central axis of the brush;  
bristles fitted radially into said core, the ends of said bristles defining the external surface of the brush, and the ends of the longest ones of the bristles defining an envelope surface;  
at least one notch in the external surface of the brush and comprising at least two secant faces, a first of said faces defining a non-concave notch back and having a height which varies along the axis, and a second of said faces defining a notch front and having a height which varies along the axis, said secant faces defining at their intersection a trough line,  
wherein the intersection of the notch front of one notch with the envelope surface of the brush or with the notch back of a second notch defines a peak ridge forming the vertex of an emergent angle ( $\alpha$ ), wherein the two secant faces are asymmetric and form a reentrant angle ( $\beta$ ) of between  $60^\circ$  and  $180^\circ$  at any point along the trough line.